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## IN THIS ISSUE

| | Page |
|---|---|
| DECLINE AND RECOVERY IN EUROPEAN AGRICULTURE: WORLD WARS I AND II | 66 |
| Recovery after World War I | 66 |
| Recovery after World War II | 70 |
| ECUADOR'S FORESTS AND THE WAR | 75 |
| Major products | 75 |
| Government policy | 80 |
| Effects of the war | 80 |

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# Decline and Recovery in European Agriculture: World Wars I and II

**by NAUM JASNY***

**In considering the recovery of European agriculture, the term is used in the rather widely accepted but by no means uncontroversial sense of a simple restoration of the total volume of prewar production. When that type of recovery is attained, population mostly is higher than before the war, and, hence, per capita production remains below prewar levels. Since the demand for agricultural products in the first place depends upon the number of persons to be provided for, a recovery in total production but without attaining the prewar per capita levels is not a true recovery. Several years usually pass after the recovery in total production has been attained before the recovery of prewar levels in per capita production.**

## Recovery After World War I

### RECUPERATIVE POWERS

The easy recuperation visualized by some authors for European agriculture after this war has a relatively greater chance of occurring in densely populated countries with a primitive, largely self-sufficing, agriculture. Men return from the wars, and if not too many of them have been killed and crippled and if enough draft power is also available, everything needed for crop production is there, and operation can be resumed at nearly prewar levels almost immediately. However, horses, the principal source of draft power on farms, are also decimated during wars, and they, as well as the other draft animals, propagate and mature slowly. A decline in these animals, say by 25 percent, can rarely be made good in less than 5 years, and usually more time is needed for such a recovery.

Where manure and/or fertilizer is applied to the land, restoration of soil fertility depends on the restoration of livestock herds and/or the availability and distribution of commercial fertilizer. Distribution of this fertilizer, a cheap product used in large quantities, cannot be resumed before transportation is restored. Moreover, when manure and/or commercial fertilizer is commonly supplied in peacetime and the supply is reduced in wartime, the land loses in fertility during the war, and a few years may pass after everything, including fertilizer, has recovered before the previous soil fertility is fully regained. Applications of commercial fertilizer in quantities greatly exceeding those of prewar years can speed up this process, but such applications may be impossible.

The restoration of milk production is likewise a slow process once cow numbers have declined substantially. A decline in milk yield per cow caused by a shortage of concentrates can be eliminated much more rapidly. Increased feeding of concentrates can also make up for a moderate decline in cow numbers, but oil cake, the principal concentrate for cows, is a byproduct, the availability of which depends on international trade, specifically on supplies of oilseeds in surplus countries, shipping space at moderate rates, and adequate demand for the oil.

The restoration of the production of beef and veal runs parallel to the rehabilitation of draft and milk cattle. It is noteworthy that the rehabilitation of all kinds of cattle occurs at the expense of the current meat supply. Hence, an acute meat shortage, rather normal for conditions after the end of a war, proves in itself a retarding factor for the rehabilitation of cattle numbers.[1] Meat rationing was actually resumed in Britain after World War I in order to prevent excessive slaughter of breeding stock.[2]

The usual opinion is that hog and poultry numbers can be quickly restored. Physically, indeed, a decline in these animals by as much as 75 percent can be made up in 1½ to 2 years. But these animals subsist largely on grain and/or potatoes; hence, where they depend on locally produced feed, their rehabilitation cannot precede the recovery of crop production. Since cattle in some areas largely depend on natural grass, little affected by wars, they may actually reach prewar numbers sooner than hogs. Hog and poultry keeping, based on imported feed, is among the few items of European agriculture capable of rapid recovery. As in the case of oil cake, however, imported feed may not be available in needed quantities for some time after the end of the war.

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*Office of Foreign Agricultural Relations.

The first part of this study, a discussion of the decline in European agriculture during World Wars I and II, appeared in the April issue of FOREIGN AGRICULTURE.

[1] To a smaller extent the same is true of sheep and to a very small extent of hogs.

[2] LEAGUE OF NATIONS. ECONOMIC FLUCTUATIONS IN THE UNITED STATES AND UNITED KINGDOM, 1918–1922. 93 pp., illus. Geneva. 1943. See p. 46.

The physical factors thus far considered are by no means the only ones on which the rate of recovery of agricultural production depends. Wars are commonly accompanied by changes in boundaries. The creation of Poland after World War I meant the transfer of a large territory from the highly developed economy of Germany into a much more backward environment. It is especially important that the relation of prices at which farmers sell and buy became much less favorable in those areas than when they were part of Germany. As late as 1934–38 their per acre yields were still some 15 percent below those obtained 25 years earlier. The separation of Hungary and parts of Yugoslavia from their natural markets in Austria also proved handicaps, although milder ones, to their recovery.

Wars frequently cause monetary disturbances. Run-away inflation also occurred in many European countries during and especially after World War I. Germany did not liquidate its tremendous inflation until 1923, Austria until 1922. Monetary disturbances, although milder ones, continued in Great Britain, France, Italy, and some other countries much longer. The effects of inflation on farm production were mixed but, on the whole, possibly favorable. Inflation adversely affected the purchasing power of the urban population for farm products. But, on the other hand, by practically removing farm indebtedness, it exerted a favorable effect even after the currency was again stabilized, by reducing payments on debts and by permitting new loans to be invested in production.

The three large importing countries of continental Europe—Germany, France, and Italy—gave their agricultural production a great deal of protection by tariffs or otherwise before the war. They abolished this protection, however, at the onset of the war and did not, or could not, restore it at once after the armistice and, even after having again started on this path, proceeded only gradually.[3] To some, possibly considerable, extent, the adverse effect of the absent or reduced protection on the recovery was offset by inflation in those countries.

Wars tend to unearth all kinds of accumulated grievances which burst out in rapid sequence. The Russian civil war, which proved only the beginning of a renewed decline in agriculture much greater than that caused by the war itself, was the most conspicuous of such phenomena. In the other countries of eastern Europe, especially Rumania and Poland, the peasants used the weakening of the central government to force the subdivision of large estates which, whatever its justification and long-term results, necessitates many changes and adjustments that impede rapid recovery of farm production. In Rumania, where the expropriation of large landowners was performed in one stroke, the land reform even materially increased the rate of the decline caused by the war. It is noteworthy that the civil war in Russia and land reforms there and in adjacent countries prevented a speedy recovery in the very areas where, owing to dense population and primitive farm techniques, it would otherwise have been most likely.

Specifically with reference to Germany, its position as a defeated country, with the prospect of paying huge reparations, was in itself not conducive to rapid recovery of the economy in general and of agriculture in particular.

The great decline of food production in war-torn countries created, immediately after the armistice, a demand for food at any price. Scarcity of supplies in exporting countries and of shipping space aggravated the situation. A real boom in agricultural products, notably sugar, developed. Especially in importing countries, price relationships were even more favorable for farm products than the very favorable price relationships of the last years before the war. But the boom lasted less than 3 years.

The very favorable prices of agricultural commodities immediately after the armistice certainly stimulated the recovery of agricultural production in Europe, but they occurred at the very time when physical obstacles, such as shortage of men and draft power, poor transportation, etc., could be overcome only gradually. Moreover, in countries with rapidly increasing inflation, a large portion of the high prices secured went to middlemen. Also, the prevailing high feed prices were not conducive to the rehabilitation of livestock herds.

The physical obstacles to agricultural recovery were less strong in later years, when, however, recuperation had to proceed in a price atmosphere less favorable for agriculture than that of prewar years. This factor probably had a greater importance only in countries with extensive agriculture. In those practicing intensive agriculture, low prices of commercial fertilizer offered a marked stimulus toward recovery. Prices of farm machinery also were not higher relatively than those of farm products. In several countries, moreover, the effect of less satisfactory international prices, expressed in gold, was offset by inflation.

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[3] See, for details, pp. 610, 714, 812–813 of BACON, L. B., AND SCHLOEMER, F. C. WORLD TRADE IN AGRICULTURAL PRODUCTS . . . 1,102 pp. illus. Rome. 1940.

## THE COURSE OF RECOVERY

Total agricultural production of Europe, ex-USSR, probably reached the prewar level in 1926 or a little later; that is, in 7 years or slightly more, after the 1919 low. Crop production did not recover before 1927, although the application of commercial fertilizer reached the prewar level between 1920 and 1922. According to the computations of the League of Nations,[4] the average production of grain and potatoes was the same during 1925–29 as in 1909–13, 139,100,000 and 139,600,000 metric tons (153,300,000 and 153,900,000 short tons), respectively. This would point to 1927 as the year when the prewar level was restored. But during 1925–29 production was favored by climatic conditions. Average production of 1926–30 was exactly the same as that of 1925–29. Hence, it seems fair to place the point of recovery for grain and potatoes between 1927 and 1928. Sugar regained the prewar level as early as 1924–25. While horses reached this level around 1924, cattle and sheep needed 2 years more; hogs, the fastest multiplying animals among those enumerated, recovered last, 3 years later than horses. Meat and, especially, milk production reached the prewar level somewhat sooner than numbers of productive livestock.

Since the total decline in agricultural production of continental Europe, ex-USSR, in the first-war period was estimated at slightly more than 25 percent, the recovery was equivalent to an increase by about one-third. Official statistics indicate that the recovery was rather rapid in the first 2 years (1919 to 1921) and then slowed down. While this is entirely possible, statistics of the first postwar years are not sufficiently accurate for definite conclusions.

## BY COUNTRIES

The recovery of European agriculture by 1926 or slightly later is obviously only an average. The agricultural production of Germany, for years handicapped in its progress by a combination of numerous adverse factors, reached the prewar level in 1927–28.[5] In France, this happened even later. Troubled, among other things, by shortage of farm labor,[6] France's agriculture was probably the last to regain the prewar level.

On the other hand, Denmark's agriculture was one of the first to recuperate. Yet even there recovery to the prewar level required about 4 years. Denmark's hog numbers slightly exceeded those of 1914 by 1923, but milk production was a little below prewar in that year. Spain, of course, which had expanded its production during the war and thus diminished the average decline in Europe as a whole, continued its expansion after the war with a corresponding effect on the average for continental Europe, ex-USSR.

The prewar level of production in the USSR was restored in 1927–28. Not before 1929 did the total acreage (other than in sown grasses) again reach the prewar level. The same was true of total crop production. Productive livestock, however, recuperated from the low of 1922 in almost 3 years; hogs exceeded the 1922 level by 1924, and cattle practically reached this level in that year. Production of animal products probably was at the prewar level around 1925.[7]

The small-scale, largely self-sufficient, peasant farming of Russia showed a great recuperative power, especially in the first years when the principal objective was to produce enough food for the peasant households themselves. The recovery in that stage would have proceeded even more rapidly if it had not met an insurmountable obstacle in the deficiency of draft power, which was particularly large, because the decline in workstock by more than one-third[8] was accompanied by an increased need for it caused by the elimination of all but the very small farms. The rate of recovery, however, slowed down greatly about 1925. The liquidation of all large- and middle-sized farms, which had been the principal producers for the market, proved a strong obstacle to agricultural recovery in this stage, when the needs of the producers themselves had been more or less satisfied and the further expansion had largely to serve the market. The worsening of the price relationship between farm and nonfarm products, which was particularly great in the USSR, was another effective handicap in this stage.

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[4] League of Nations. AGRICULTURAL PRODUCTION IN CONTINENTAL EUROPE DURING THE 1914–18 WAR AND THE RECONSTRUCTION PERIOD. 122 pp., illus. Geneva. 1943. See p. 59.

[5] Berlin Institut für Konjunkturforschung. DIE DEUTSCHE AGRARPRODUKTION. Berlin Inst. f. Konjunkturforsch. Wchnber. 10 (40): [227]–228. illus. 1937. In using the data of the Institute, the share of the portions of Germany lost after World War 1 in the net agricultural production was considered equivalent to 15 percent.

[6] According to Augé-Laribé, 673,700 farmers were killed in the war; those crippled to such an extent as to become unavailable for work totaled 500,000, and the number of both sexes who migrated to the cities soon after the end of the war, 500,000. Thus agriculture's total permanent loss of labor exceeded 1.5 million (p. 115, FOOD SUPPLY IN FRANCE DURING THE WAR).

[7] The great shortcomings of Russian livestock statistics prior to World War 1, and their unavailability for the production of animal products at that time, make the comparisons uncertain.

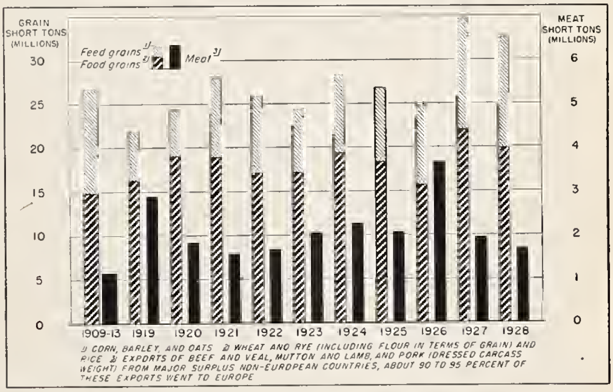
The USSR, incidentally, is one of the countries for which it is especially misleading to treat the restoration of the prewar level of farm production as a real recovery. The materially increased farm population, with production at the prewar level, implied greatly reduced marketings by the peasants. Not only could the large prewar agricultural exports have been resumed only to a small extent, but the small marketings of farm products by the peasants proved a serious obstacle to the great industrialization drive upon which the USSR embarked in the late 1920's. When the Government decided on this drive, it saw no other way to attain the needed large increase in marketings by peasants except through collectivization of peasant farming.

Most of the changes which occurred in Great Britain[9] during the war were liquidated in 3 to 5 years. The peak of wartime changes mostly having been reached in 1918, grain and potato acreages, greatly expanded during the war, were back to practically prewar levels in 1923. Hogs far exceeded the 1913 level as early as 1921, and the rehabilitation of milk production, which was only a matter of recovery of the yield per cow, was nearly accomplished in that year.

## RECOVERY OF IMPORTS

The buying rush, which followed the end of hostilities, could not be fully satisfied at once. Not all needed supplies were available in the surplus countries, especially because Russia, one of the principal prewar exporters of farm products, was crippled by civil war. Shortage of shipping space and exorbitant freight rates were other important handicaps.[10] Imports into Europe were promoted, it is true, by the absence of import tariffs and other restrictions, but part of this effect was offset by inflation.

While the trade statistics of the first postwar years are somewhat defective,[11] the statement nevertheless is warranted that total net imports of farm products into Europe, ex-USSR, exceeded the prewar level very soon after the armistice. In accordance with the nature of demand and influenced also by the available supplies, imports of ready-to-eat products recovered first. As early as 1919 net imports of food grain (wheat, rye, and rice) exceeded those of 1909–13 by about 9 percent (16,200,000 short tons as against 14,900,000 tons). (See fig. 1.)



1/ CORN, BARLEY, AND OATS 2/ WHEAT AND RYE (INCLUDING FLOUR IN TERMS OF GRAIN) AND RICE 3/ EXPORTS OF BEEF AND VEAL, MUTTON AND LAMB, AND PORK (DRESSED CARCASS WEIGHT) FROM MAJOR SURPLUS NON-EUROPEAN COUNTRIES, ABOUT 90 TO 95 PERCENT OF THESE EXPORTS WENT TO EUROPE

FIGURE 1.—Net imports of grain and meat into Europe, ex-USSR, average 1909–13, annual 1919–28.

The almost negligible prewar sugar imports reached the substantial level of almost 3,000,000 short tons in 1919–20. Meat exports from the principal surplus countries, practically all of which went to Europe in 1919, were double those of prewar years, owing only partly to additional shipments to the American Army. Imports of oilseeds also were large from the start, making both vegetable oil and oil cake available in large quantities. The great demand for vegetable oil was caused largely by the shortage of butter; while domestic production of butter was small, imports

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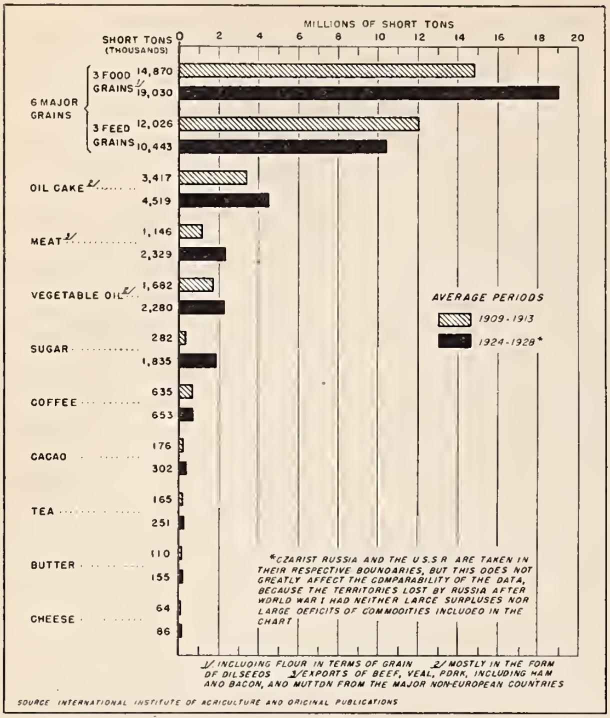
[8] 38.9 percent; see p. 250, THE SOVIET UNION LOOKS AHEAD: THE FIVE-YEAR PLAN FOR ECONOMIC CONSTRUCTION. 275 pp., illus. New York. 1929.

[9] Including Northern Ireland.

[10] The free rates on wheat from Argentina to Britain in 1920 exceeded the prewar price of Argentine wheat in the latter country.

[11] This is especially true of German statistics for 1923 and 1924, as well as for 1919. Also, the statistics of imports into western Europe in those years probably included shipments for the American Army.



*CZARIST RUSSIA AND THE U.S.S.R. ARE TAKEN IN THEIR RESPECTIVE BOUNDARIES, BUT THIS DOES NOT GREATLY AFFECT THE COMPARABILITY OF THE DATA, BECAUSE THE TERRITORIES LOST BY RUSSIA AFTER WORLD WAR I HAD NEITHER LARGE SURPLUSES NOR LARGE DEFICITS OF COMMODITIES INCLUDED IN THE CHART

1/ INCLUDING FLOUR IN TERMS OF GRAIN 2/ MOSTLY IN THE FORM OF OILSEEDS 3/ EXPORTS OF BEEF, VEAL, PORK, INCLUDING HAM AND BACON, AND MUTTON FROM THE MAJOR NON-EUROPEAN COUNTRIES

SOURCE INTERNATIONAL INSTITUTE OF AGRICULTURE AND ORIGINAL PUBLICATIONS

FIGURE 2.—Net imports of specified commodities into Europe, ex-USSR, average 1909–13 and 1924–28.

were also much smaller than before the war. Large Russian prewar exports of butter could not be immediately compensated for by shipments from other countries. Cheese imports in 1919, though small, greatly exceeded those of prewar years. On the other hand, imports of feed grain totaled only 5,600,000 short tons in 1919 as against the 1909–13 average of 12,000,000 tons.

Except for sugar, net imports of all major foods and feedstuffs continued to increase after 1919. Net imports of food grain increased to 19,000,000 short tons in 1920 and, with the usual year-to-year variations, remained at this high level for years. Feed grains showed a more gradual, but in the aggregate much stronger, advance, reaching the prewar level in 1927. Total grain imports of Europe, ex-USSR, regained the prewar level by 1921 (fig. 1).

Net imports of all major foods during 1924–28, that is, at a time when domestic production was not quite restored, exceeded the prewar imports of those commodities on the whole by a large margin (fig. 2). Increase in imports was negligible only as regards coffee, amounting to 3 percent. The large increase in imports of vegetable oil, caused by an increase in both food and technical consumption, was particularly significant. The same is true of imports of oil cake. Both oil and oil cake were mostly imported together in the form of oilseeds. While oil cake is a byproduct, the large demand for it especially supported prices and imports of such oilseeds as soybeans, which contain relatively little oil but a large residual of valuable protein feed. Additional imports of oil cake offset part of the deficit in imports of feed grains. While the shift in imports from feed grain to oil cake had many causes, one of these was the increased attention to milk as food, to the cow as an efficient converter of feed into highly valuable foodstuffs, and to feed concentrates as a means to increase the effectiveness of many cheap (otherwise unusable) local foodstuffs.

The continued increase in the net imports of Europe, ex-USSR, after the initial postwar years, in the face of a gradual recovery of domestic production and a similar restoration of tariffs in the large continental countries, is not surprising. Since imports of food and feed constituted only a relatively small proportion of the total supply of these products, food consumption in the initial postwar years was small despite large imports. Indeed food rationing had to be maintained in certain countries for some time after the end of hostilities. Progress in general economic recovery permitted an increase in consumption, which exceeded the rate of increase in domestic production and necessitated enlarged imports.

Enlarged net imports of food and feed into Europe, ex-USSR, occurred in the face of greatly reduced exports from the USSR, which had gone almost exclusively to the rest of Europe. This obviously implied a great increase in overseas shipments to Europe. Exports of the European surplus countries other than the USSR in the period of recovery also were much smaller than before the war; hence, the imports of the normally importing European countries did not increase over the prewar level to the extent indicated by net import figures for Europe, ex-USSR.

## Recovery After World War II

A minimum of 5 years would seem to be required for the restoration of prewar agricultural production in Europe. The same or similar factors, which, in spite of more unfavorable conditions during this war, prevented a greater decline in agricultural potential than during the last war, permit a quicker recovery now; but certain other factors may prove even more unfavorable.

Aside from the USSR, labor probably will be somewhat more ample than after World War I. Technical developments since the first war, especially those pertaining to machinery and fertilizer, will permit agricultural recovery to proceed more speedily. Improved planning techniques, which slowed the decline in agricultural production during this war, may speed up postwar recovery. Monetary disturbances may be less than they were after World War I, and the ability to handle them has certainly improved. Changes in boundaries will have about the same effect as last time.

The cutting down of the German economic potential decided upon at Potsdam may prove a much more potent retarding factor than the country's set-back after World War I. Every country in continental Europe, ex-USSR, more or less heavily depended on Germany as a seller, buyer, or both, and the elimination of Germany from this role, or a great diminution of its activities, will necessarily have an adverse effect on the recovery of agriculture, in some cases a strongly adverse effect. Land reforms in some important countries, as well as political reorientations, also may retard recovery more than after World War I.

## PRODUCTION FACTORS

**Manpower.**—Even with the application of the mildest of the proposed restrictions on the future industrial activities of Germany, the manpower situation in German agriculture will probably be even more favorable in the future than it was after World War I. On the other hand, should Germany's former markets for industrial products in eastern and southeastern Europe be accessible to western European countries, the supply of farm labor in those western countries, which will share in the inheritance of Germany's industrial potential—most likely Belgium and France—may prove shorter than it was after World War I.

**Farm Machinery.**—The farm tractor was making its first uncertain steps during the first war and had a small part in the ensuing agricultural recovery of Europe. It has since been vastly improved, however, and has acquired great importance throughout the world. The tractor was used, although only to a moderate extent, in continental Europe to lessen the decline in crop production during this war and will be used to speed up postwar recovery. Indeed, all European countries which lost animal draft power in this war want to replace it, at least in part, by tractors and thus avoid waiting until the animals are bred and matured.

Only a relatively small number of tractors were put in operation in continental Europe during the war, because, in the first place, industry was concentrated on armament production, and motor fuel was short. In the recovery, however, the fact may be important that the predominance of very small farms and the intensive type of farming practiced in many European countries do not favor the use of tractors. Various forms of collective use of new tractors had to be resorted to during the war and will be necessary during the recovery. The results have not always been satisfactory.

Perhaps half a million tractors would be needed to replace fully the animal draft power lost in continental Europe, ex-USSR, but such a large number cannot be utilized efficiently. As many as may be employed with advantage can probably be supplied within a short time by the United States and some few by Great Britain.

Germany used to be a source of supply for continental Europe, ex-USSR, not only of tractors but of all agricultural machinery. The loss of this source and the time required for building up an adequate substitute in other countries will certainly handicap recovery, particularly since the use of farm machinery of all kinds has expanded in the past 25 years.

**Fertilizer.**—The great increase in the use of commercial fertilizer in the inter-war period resulted largely from the spread of knowledge as to its usefulness among farmers but even more from an improved price relationship between farm products and commercial fertilizer. This development has created the possibility of offsetting the shortage of manure, inevitable for some span of time after wars, as well as the impoverishment of the soil during the war (largely caused by lack of manure and fertilizer in sufficient amounts), by enlarged applications of commercial fertilizer. But will it be feasible to realize this possibility soon?

German mines are the principal source of potash in continental Europe, ex-USSR, and indeed in the world. Fortunately for the agricultural recovery in Europe, there is no intention to impose limitations on Germany with respect to this industry. But the resumption of the extraction of potash, a simple operation in itself, on a large scale will have to wait until the German transportation system is reconditioned. Also because of disorganized transportation, France, the second European source of potassium, for a time may not be able to provide enough potash even for its own farms.

The principal sources of phosphatic fertilizer in Europe, ex-USSR, are natural phosphate from the United States, and especially from North Africa, and basic slag. Most of the natural phosphate is processed into superphosphate. Of the two principal types of phosphatic fertilizer, basic slag is the cheaper source of phosphoric acid and superphosphate the more expensive one.[12]

The restoration of full supplies of basic slag depends on the rehabilitation of the steel industry. Owing to the large limitations which are being imposed upon the German steel industry, the restoration of the prewar output of basic slag in continental Europe is unlikely for several years.

On the other hand, supplies of natural phosphates, at least from French North Africa, may soon be available in larger quantities than in prewar times. But will the farmers soon be able to absorb sufficient quantities of this so that the shortage of basic slag will be offset or even overcompensated? Even the prewar quantities of phosphatic fertilizer will cost them more now than before the war owing to the partial replacement of the cheaper basic slag by the more expensive superphosphate. Specifically, in Germany the general economic situation and particularly the foreign-exchange problem are likely to be such that the total consumption of phosphatic fertilizer may not reach the prewar levels for a long time.

Germany's chemical industry not only provided ample supplies of nitrogen for its own agriculture—at a very favorable price relation to farm products—but also certain quantities for export. Foreign exchange will hardly be available for imports of nitrogen if Germany's production of nitrogen is cut below the prewar consumption by its agriculture. The quantities of nitrogen obtained by the European countries from Germany were not so large as not to be easily replaceable in the long run. But at the moment nitrogen production in most European countries is far from the prewar level owing to coal shortage. A few years may pass before consumption of nitrogen in the agriculture of continental Europe, ex-USSR, exceeds the prewar level.

## LAND REFORMS

The negative effects that the breaking up of large estates are likely to have on agricultural recovery in eastern Europe will certainly be considerable. They may indeed be larger than they were after the first war.

Not less than one-third of the total farm land was subject to subdivision in Hungary this time. This proportion was large also in Poland and the portion of Germany which may be definitely turned over to Poland. In Yugoslavia, about 13 percent was involved in the action. The proportion of farm land subject to subdivision was small in Rumania, and negligible in Bulgaria.

In all those countries the confiscation of the large estates was to be accomplished, or has already been accomplished, in only a few months. Even under normal conditions it would be impossible in such a short time to find a sufficient number of persons willing to settle and having the necessary capital and experience. Furthermore, even if the needed financial resources were available, equipment, building material, livestock, and the like are simply not adequate. Part of the confiscated land necessarily remains uncultivated. This acreage must be particularly large now, because, while parcelation of farms increases the needed amount of draft power, this power actually declined in all countries involved and in some of them, for example Hungary, declined greatly.

Another adverse factor of the action is that the large estates are mostly subdivided into units that are too small (at most 12 acres in Rumania and Poland proper; an actual average of 8 acres in Hungary). Farms of such size cannot possibly afford adequate draft power, and, hence, many of them are not real farms. It may be that the creation of a huge number of weak economic units is intended only as a transitory step to collectivized farming in one form or another. A beginning with collectivized farming indeed has already been made in Bulgaria and Rumania. Furthermore, while the middle-sized farms in the countries involved are not subject to subdivision, they apparently are not favored either. By high taxation or other means, they may be prevented from successful operation. All this points to rather fluid conditions in those countries. While the mistakes which were made in the collectivization of the peasant farms and contributed to the great decline in production in the USSR, need not be repeated, expectation of an early restoration of the prewar level of production in that large group of countries would not be justified.

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[12] The price difference in continental Europe varies from 10 percent to as much as one-third of the price of superphosphate.

This is especially true of the part of Germany east of Oder-Neisse ceded, or likely to be ceded, to Poland and Russia. It would take a long time to replace the highly efficient German operators of middle-sized farms and large estates by small peasants from the east and southeast of Poland, or by similarly backward Russian farmers. Moreover, the much less favorable price relationship between farm and nonfarm products which is likely to prevail in the new environment would exclude the former level of intensity for a considerable time, even if there were no deterioration in the quality of manpower.

The large estates are also likely to be liquidated in the remaining part of Germany; upward of 6,000,000 acres may be involved in this operation. While the terms of the parcelation are not known as yet, temporary unfavorable effects on farm production cannot be avoided.

## SHORTAGES AND THE AFTERMATH

As was the case in the initial period following World War I, Europe now is in a state when imports are desired at any price. So long as shipments continue far below requirements their inadequacy will function as a stimulus to the recovery of European agriculture. But this effect should not be overestimated. In countries such as Italy and France, the black, or unregulated, markets have reached such large proportions that not only are urban food supplies most inefficiently distributed, but the huge sums extracted from the consumers, insofar as they reach the producers at all, are by no means fully used by them to restore the productive capacity of their farms. The situation is indeed believed to be such that only large shipments from overseas, even excessive for a short time, will be able to break these runaway markets and put the agriculture of those countries definitely on the path to healthy recovery. Furthermore, so long as shipments consist almost exclusively of food, that is, include little feed, recovery of the animal industry based on imported feed cannot proceed at more than a very slow pace.

Again as after World War I, the great disproportion between shipments from surplus countries and demand by importing countries and the boom, brought about by this disproportion, are likely to be of short duration. Although the statistical needs of European countries for imported food will be larger than after World War I, owing to the loss by Germany of a large part of its surplus areas, the purchasing power of the European deficit countries, taken as a whole, may not be so large as after World War I. Moreover, the exporting countries will probably be able to fill a given demand sooner than after the earlier war. Then the loss of Russian exports had to be met. This time the countries of southeastern Europe, if they resume their agricultural exports at all, may do it later than after World War I. But exports from southeastern Europe before World War II were much smaller than exports from Russia before World War I. Moreover, the non-European exporting countries are able to make use of tractors and other modern machinery to restore, or further expand, their production more rapidly than they did after the first war. The much more favorable shipping situation, already mentioned, will be a contributing factor toward shortening the period of favorable prices of farm products in importing countries.

Drastic measures of international scope to expand greatly the purchasing power of the importing countries or to ensure for the needy areas large food imports in some other way, to curtail production in surplus countries, or both, would be needed to make the international outlook for that time more favorable than it seems to be now.

Should price spreads between farm and nonfarm products again appear—and they are almost certain to appear, unless the measures stated in the preceding paragraph are taken—the agricultural recovery in continental Europe, ex-USSR, will have to proceed under price conditions possibly more unfavorable than after World War I—with the inevitable retarding effect of this factor upon the rate of recovery.

The modification of the price situation in the three major importing countries of the European Continent—Germany, France, and Italy—which after World War I was brought about by the fact that they did not restore the protection of their agriculture for some time and, even after restoring it, kept it below prewar levels for a while, may not be repeated in the same form, at least in two of the three countries. It is true that Germany, which is losing its eastern food-surplus regions to

Poland, and also Italy will be in much greater need of imported food and feed than after World War I. Yet, a precarious domestic economy may make the need to produce everything possible at home without regard to cost even more pressing, and this would be impossible without strong restrictions on imports in one form or another.

## RECOVERY IN SELECTED COUNTRIES

The rate and duration of the recovery will again naturally vary greatly, from as little as perhaps 2 years to as much as 7 or 8 years. Norway, which during the war increased its grain and potato production but curtailed its livestock herds, expects to restore the production of the latter by the end of 1947, or in little more than 2 years from 1945. It remains to be seen whether milk production will have reached the prewar level by that time. Denmark also needs only fertilizer to make up the small decline of the prewar yields from fully preserved acreages; concentrates to restore the yields of milk from the fully preserved cow herds; and an increase in hogs by one third, the latter accomplishable in less than a year. All in all, Denmark should be able to reach prewar production in around 2 years after free access to imported fertilizer and concentrates, provided adequate foreign markets are available for its animal products. While long-time prospects for exports of these products in prewar quantities from Denmark are not bright, for the next couple of years there will be a market for everything Denmark is able to produce.

France's production of animal products can be restored to the prewar level in perhaps 3 years, provided enough imported feed is available. By the use of more fertilizer than before the war, yields of crops can be restored in about the same time. To restore full acreage, France will need approximately the prewar amount of draft power. By putting more tractors in operation, this could be accomplished in, say, 5 years. Full recovery would be reached in approximately 4 years. However, France never restored its crop acreages after World War I, partly because of the competition of the French colonies. These colonies may enter the picture again, especially if they succeed in restoring their agricultural production ahead of the mother country. Moreover, should France inherit part of the former German industial exports, a greater portion than formerly of the domestic requirements for farm products may be covered by imports. Still, prosperity may result in a moderate increase in the consumption of animal products, and, if these are produced domestically, the larger output may offset the failure, if any, of crop production to reach prewar levels.

Germany will for the time being continue along the wartime path of shifting to relatively greater production of food crops at the expense of animal industry. Even after this stage is passed and German agriculture starts on the way of real recovery, the low purchasing power of the population will prove a great handicap to the rehabilitation of the animal industry. Indeed, only because, as seems certain, Germany loses large food-surplus areas, is full recovery of agricultural production in the truncated part within the foreseeable future. Should the various zones of occupation be separated economically, recovery of agricultural production in the Russian zone is unlikely for a considerable span of time.

The prospects for a rapid restoration of the prewar level in Italy, although not so gloomy as in Germany, also are not bright. Fascist efforts to ensure the greatest possible independence from foreign supplies of food by both increased production and reduced consumption were not without considerable success. Protection given to domestic agriculture was huge and cannot now be exceeded. Italy will also have difficulty in restoring its exports of vegetables and fruits, which went mainly to Germany. The Italian diet certainly is in great need of improvement even beyond the prewar levels, and a move in this direction would favorably affect domestic food production; but there is no reason to hope that this factor will become effective soon. The possibility of a sweeping land reform, with the usual retarding effect on agricultural recovery, also has to be kept in mind.

The part of Germany which will be ceded to Poland will not restore prewar production in the foreseeable future. Subdivision of large estates and other developments will adversely affect the recovery also in Poland proper. The exchange of a poorly developed agricultural area in the east for an area of high efficiency in the west would tend to bring about an increase in the moderate agricultural exports which Poland had in prewar years, particularly in view of the fact that the ratio between population and agricultural resources is likely to improve. But inadequacy of markets for these exports or unsatisfactory prices for them would be a retarding factor for recovery.

**Soviet Union.**—Too many relevant factors are unknown with reference to USSR to permit reliable forecasts of the duration of the agricultural recovery. The guess should be chanced that the prewar level of production may be reached around 1950.

Large Russian losses in population in the present war and great stress put on rapid rehabilitation and further expansion of industry make likely a considerable labor shortage in agriculture instead of the great surplus as after World War I. The large losses of animal draft power and even greater reduction in available mechanical power on farms are unlikely to be made up before 1950.

Prewar acreages may be restored ahead of the restoration of draft power, perhaps by 1948. Since this would imply less thorough cultivation, total prewar crop production may be reached somewhat later than prewar acreages. Hog numbers will hardly be restored to prewar levels ahead of grain production. Rehabilitation of milk production will probably come last but still before the restoration of horse numbers, which may not occur at all.

By 1950, the year when the restoration of the prewar output of farm products may be accomplished, the population of the Union within its 1938 boundaries is also likely to reach or slightly exceed the prewar level. Since Russia continued to export farm products, although on a moderate scale, right up to the start of war and, in addition to that, some accumulation of stocks occurred out of the production of the last prewar years, indigenous supplies available for consumption may reach the prewar level somewhat ahead of the restoration of prewar production, provided exports of farm products are not resumed soon. The Union will probably try to get foodstuffs from the neighboring countries. But in the next few years their surpluses are unlikely to be large, and Russia will hardly have goods to pay for such imports. Unless arrangements are made for large food imports into Russia also from other territories, the Russians will have to be satisfied with a very poor diet for quite awhile.

**United Kingdom.**—While after the first war the restoration of the prewar status was regarded as a matter of course, it probably will be different this time. Shortage of foreign exchange may compel the United Kingdom to preserve all or part of its expanded grain and potato acreage. The country will nevertheless want to restore its prewar pork production. This will perhaps require no more than 2 years after the needed feed grain is obtainable from abroad at reasonable prices. Milk production may be fully at the prewar level before that time.

# Ecuador's Forests and the War

*by* **KATHRYN H. WYLIE**[*]

**The forests of Ecuador contributed many strategic products to help win the war. They were the source of most of the world's balsa exports, as well as significant amounts of rubber, cinchona, and kapok. Although forest products have been important in the export trade for a long time, the sharp wartime advance in strategic items brought them to more than one-third of the total export value in 1944. Demand for balsa dipped downward in early 1945, even before the end of the European phase of the war. Exports of all these strategic products are expected to fall quickly to prewar levels. Expansion for peacetime uses will no doubt be slow and unspectacular. In the immediate postwar period at least forest-product exports of highest value probably will be the old stand-bys—Panama hats and tagua nuts.**

## Lumber

Ecuador's forests furnish most of the country's requirements for lumber. The only imports of any consequence are of Douglas fir and yellow pine for use in the coaches and freight cars of the Guayaquil and Quito Railway Co. With the exception of balsa, little wood is exported. During the early 1930's, for example, exports averaged 787,000 pounds a year and during the late 1930's, 185,000 pounds per year. After World War II started, however, exports increased somewhat.

The forests of western Ecuador are at present the most productive of the Republic. At least 75 percent of the Province of Esmeraldas, the western two-thirds of Pichincha, one-quarter of Guayas, the eastern third of Manabí, and 40 percent of El

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[*] Office of Foreign Agricultural Relations.

Oro are well-forested and economically accessible. The Oriente of Ecuador is almost completely covered with virgin forest containing quantities of valuable timber, but this area is now inaccessible to markets and cannot be exploited until transportation facilities are developed. The Inter-Andean Valley has few stands of timber, and they are mostly of eucalyptus.

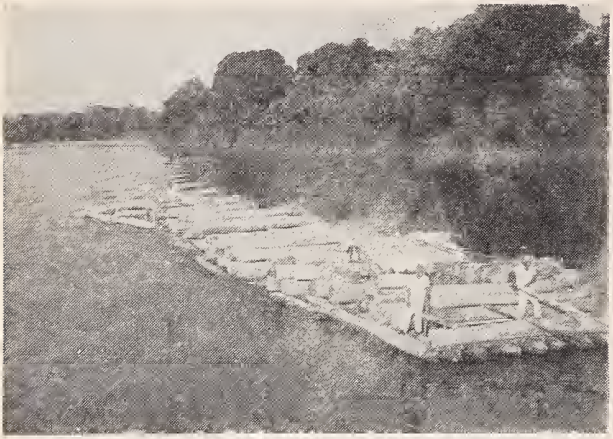

Figure 1.—Rafts of balsa logs on the Quevedo River.

## Balsa

Balsa exports increased in 1942 and 1943 to surpass Panama hats as the principal forest export of Ecuador. (See table 1.) Although balsa grows in Colombia, Brazil, Peru, Venezuela, and parts of Central America, Ecuador has supplied 90 percent of the commercial product.

Balsa, as far as is known, was first used by the Inca Indians, approximately 500 years ago, for making rafts to transport their army and equipment up the Guayas River. Little use was made of this wood, however, from then until a few years ago. Not until 1936 did exports constitute a significant item of trade. Balsa was exploited, and its use was promoted for making toys, movie sets, life preservers, and insulation. The wood is buoyant and extremely light in weight. Eucalyptus wood, for example, is 12 times heavier than balsa, and wood of the willow tree is 6 times as heavy.[1] After World War II started, the uses for balsa multiplied, and it became a strategic war material in the construction of the Mosquito bomber and life preservers and rafts. Exports increased from an average of about 4,600,000 pounds in 1936–40 to 19,860,000 pounds in 1942 and 30,100,000 pounds in 1943 but in 1944 dropped again to 20,500,000 pounds.

About 65 percent of the balsa cut in Ecuador is from the section around Quevedo, a town west of the Andes midway between Quito and Guayaquil. Growing conditions there are ideal, the area being damp but well-drained, with a thick layer of topsoil. In addition to the wild growth, plantation balsa is produced in this section. Another 25 percent of the wood is obtained in the area surrounding Esmeraldas in the extreme northwest corner of the country. The third producing section is in Manabí along the coast from Manta east to Santa Ana and north to the coast again in a semicircle. Southeast of Guayaquil in El Oro there are a great many balsa trees, but these have not been cut to any extent.

The balsa tree grows rapidly and is ready to cut when it is 2 years old, although the most economical cutting age is between 6 and 9 years. It grows to an average height of from 50 to 100 feet, the trunk growing straight for almost two-thirds of its length before branches or leaves appear. During the first years of its growth, balsa saps the strength from other trees in the area, with the exception of the *papaya de mono*, which grows even more rapidly.

At present balsa trees are felled by the workmen with a machete, or broad-bladed ax, the bark is removed immediately, and the end of the log "sniped"; that is, it is pointed, and a groove is cut just above the point into which a chain or rope is fitted to drag the log to the river. Here the laborers tie the logs together to form a raft, sometimes building a thatched hut atop the raft, and begin the journey down the river to the ports. Often cargoes of agricultural products are picked up along the way and carried on the raft to markets on the coast. Balsa from Quevedo reaches Guayaquil by way of the Guayas River, that from the northwest goes down the Esmeraldas River to the port of the same name, and that from Manabí goes by river to Manta and Bahía de Caráquez in the wet season and by rail or truck to Manta during the dry season.[2]

The principal sawmills are located at Guayaquil, but there are mills also in Esmeraldas, Manta, Bahía, Borbón, Limones, and Río Verde. Most mills are equipped with circular saws to cut the logs into lumber. After the logs are cut, the lumber is either kiln-dried or sun-dried. Kiln drying requires only from 3 to 10 days, whereas sun drying takes 20 days in the dry season and much longer during the rains. Mill capacity is sufficient to handle the quantity of logs obtained by the cutters. Approximately one-quarter of the logs delivered to the mills are water-logged [3] and contain worm holes or other defects that make them unsuitable for use. Apparently none of these defects can be determined until the logs are sawed.

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[1] U. S. Forest Service. the forests of ecuador. [Manuscript in process of preparation.]

[2] Much of this background material is based on Tewksbury, Howard H. balsa wood industry. U. S. Cons. Rpt. No. 1364, 26 pp., illus. Quito. April 14, 1944.

Practically all the balsa cut in Ecuador is exported, very little being used domestically. Before the war, practically all went to the United States. That market absorbed about 90 percent of the total amount shipped during the war, and the United Kingdom took practically all the remainder for use in airplanes. Because of its strategic character, balsa obtained shipping priority and moved freely from the ports. Wartime demand for this wood began to decline after mid-1944.

## Rubber

For many years Ecuador has exported small quantities of rubber, largely from wild trees of the species *Castilla elástica*. These trees grow in the damp, tropical regions of western Ecuador from Esmeraldas to the northern part of the Province of El Oro. Most of the present output of rubber comes, however, from the Provinces of Manabí and Esmeraldas. Yearly exports did not exceed 2,200,000 pounds until 1925, after which they fluctuated between 2,200,000 and 4,400,000 pounds until in 1942 they reached a peak of 6,600,000 pounds. The rubber exported from Ecuador (*caucho maroma*) has been classed as "scrap" in world markets.

Many areas are also suited to the production of *Hevea brasiliensis*, a native of the South American tropics. A technical mission from the United States in 1924 reported that about 2,500,000 acres of land along the western foothills of the Andes are suitable for growing rubber trees. A second mission in late 1940 recommended that an experiment station be established to aid in rubber production.

Under a memorandum of understanding between the Ministry of Agriculture of Ecuador and the Bureau of Plant Industry of the United States Department of Agriculture (November 20, 1940), two hevea nurseries were established. In these nurseries, thousands of trees have been produced from both imported and local seeds, and budded stumps and budwood of hevea trees have been imported and tested for adaptation to Ecuadoran conditions.

In July 1942 the Rubber Reserve Company (later the Rubber Development Corporation) of the United States Government contracted with the Ecuadoran Government for the purchase of the entire exportable surplus of rubber during the following 5 years at the rate of 33 cents a pound, f. o. b. Guayaquil. The Rubber Reserve Company agreed to furnish Ecuador certain quantities of rubber manufactures. The price was raised to 44 cents early in 1944. Late in 1942 an understanding was reached whereby the Rubber Reserve agreed to furnish $500,000 for rubber development, such fund to be administered and expended by the Ecuadoran Development Corporation. This understanding was terminated on November 20, 1943, and the procurement program passed into the hands of the Rubber Reserve.

TABLE 1.—*Exports of selected forest products fram Equador, 1911–44.*

| Year | Balsa | | Rubber | Cinchona bark | Kapok | Panama hats | Tagua nuts | | Other wood | Mangrove bark |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lumber | Logs | | | | | In husk | Husked | | |
| | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* | *1,000 lbs.* |
| Average: | | | | | | | | | | |
| 1911–15 | (1) | 22 | 708 | 132 | 161 | 311 | 16,030 | 19,711 | 71 | 514 |
| 1916–20 | (1) | 18 | 633 | 179 | 75 | 368 | 17,035 | 27,472 | 2,028 | 1,905 |
| 1921–25 | (1) | 425 | 1,109 | 234 | 381 | 355 | 12,906 | 40,110 | 2,467 | 2,623 |
| 1926–30 | ----- | 952 | 1,226 | 196 | 553 | [2] 472 | 8,263 | 41,136 | [3] 1,960 | [3] 375 |
| 1931–35 | 503 | 928 | 547 | 172 | 701 | [4] 1,780 | 1,933 | 45,922 | 787 | 66 |
| 1936–40 | 2,709 | [5] 1,883 | 3,485 | 170 | 1,008 | [4] 1,369 | 1,508 | 53,850 | 185 | 77 |
| Annual: | | | | | | | | | | |
| 1941 | 10,348 | | 3,430 | 119 | 240 | [4] 1,981 | 974 | 30,864 | 3,208 | 77 |
| 1942 | 19,863 | | 6,691 | 207 | 719 | [4] 2,516 | 774 | 28,737 | 3,748 | 104 |
| 1943 | 30,119 | | 4,819 | 2,837 | 326 | [4] 2,756 | 351 | 24,409 | (6) | (6) |
| 1944 | 20,558 | | 6,175 | 7,000 | 915 | [4] 4,373 | (6) | 23,781 | (6) | (6) |

[1] Included in otber wood.
[2] 3-year average, 1926–28.
[3] 3-year average, 1926, 1929–30.
[4] Thousands of hats.
[5] 3-year average, 1936–38.
[6] Not available.

Before the war, most of the rubber went to Germany and the United States, these two markets taking 53 and 36 percent, respectively, of the total shipments from 1935 through 1939. Germany dropped out of the picture entirely in 1940, and during the next 2 years Argentina, Chile, and Japan took an increasing share of the total.

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[3] A structural change of fibers occurring at the time of tree growth.

## Cinchona

The cinchona tree, the source of quinine, is native to tropical America. The two species most characteristic of Ecuador are the *Cinchona officinalis*, having gray bark and originating in Loja Province, and the *Cinchona succirubra*, or red-bark tree, originating in the subtropical regions of the western Andes. The gray bark of Loja is almost all exported to Peru over the frontier. Red bark is usually shipped from Guayaquil. Most of it is carried by mules to Babahoyo and by river from Babahoyo to Guayaquil; smaller quantities come also from Bucay and from the Colonche Mountains of Manabí. The bark of *Cinchona officinalis* and *Cinchona pitayensis*, found mainly in the eastern cordillera, is at present inaccessible because of inadequate transportation facilities.

Most of the Ecuadoran product comes from wild trees, although recently a few farmers in the Province of Bolívar have planted small acreages to cinchona. The harvest or collection usually begins in August, when workers go into the forests to search for red cascarilla bark. The trees are felled, and the bark is taken off with machetes and dried on a "tilt" or scaffold under which a fire is built. Until recently, practically no effort had been made to use kilns for drying.

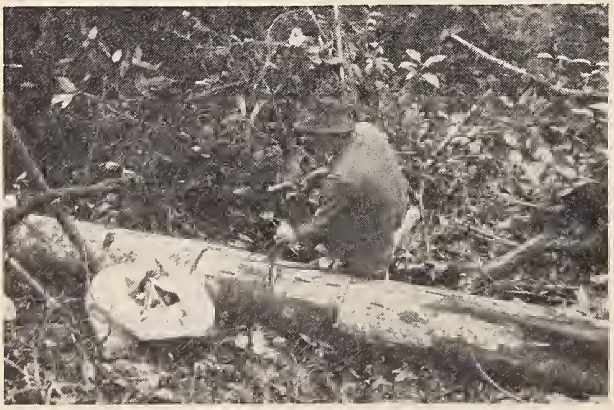

FIGURE 2.—Stripping bark from a cinchona tree.

Cinchona bark has been an Ecuadoran export product for many years. Not until 1943, however, did it reach a significant total. Under wartime demand, exports rose from 207,000 pounds, valued at $32,000, in 1942 to 7,000,000 pounds, valued at $733,000, in 1944. Before the war, Germany and Japan were the principal markets. All recent exports have been to the United States.

As part of its wartime effort to find new sources of quinine, the United States Government (through the Defense Supplies Corporation) signed an agreement with the Ecuadoran Government on February 23, 1943, for the exploitation, production, and exportation of cinchona bark. The Ecuadoran Development Corporation was designated as the exclusive agent of Defense Supplies Corporation in carrying out this program. Defense Supplies agreed to furnish not less than $300,000 to finance the work.

A new contract signed on September 6, 1944, between the U. S. Commercial Company, which has taken over the Latin American work formerly performed by the Defense Supplies Corporation, and the Ecuadoran Government relieved the Development Corporation of all responsibility with reference to the procurement program for cinchona bark. This latter agreement was terminated in early December 1944, and arrangements were made to transfer to the Government of Ecuador equipment owned by the U. S. Commercial Company. Part payment for this equipment was the unexpended portion of the $300,000-development fund. The Ecuadoran Government agreed to use a sum equal to the value of the equipment (set at $193,455) in carrying out the plantation and nursery projects already under way.

## Tagua

Tagua is one of the more important minor products of Ecuador. It has been exported for many years, but the rapid development of the plastic industry is competing strongly with the natural product. The tagua nut from the tropical forests is hard, durable, and resembles ivory. It is used for the manufacture of many novelty products, such as chess men, dice, poker chips, umbrella handles, and religious ornaments, but its most important use has been in the manufacture of buttons. The nuts are collected from wild palm trees, the amount gathered usually depending on the demand in foreign markets. The principal crop is from January to May, but a few nuts can be collected the year around. Although the tagua tree grows wild in jungle areas from Panama to

Peru, Ecuador is the center of production as is suggested by tagua's scientific name, *Phytelephas equatorialis.*

Before the war, during 1935–39, exports averaged 56,753,000 pounds a year. By 1942 they had declined to 29,511,000, but tagua nuts still ranked seventh in value among Ecuador's exports. Although the United States is now the principal market, it took only 20 percent of the total shipments before the war, whereas Japan took 19 percent and the three European countries of France, Germany, and Italy together took 41 percent of the total. With the loss of the European markets, prices declined, but in 1942 Argentina and Brazil took large quantities of the nut. The United States also increased its purchases, largely for use as buttons for service uniforms.

## Kapok

Kapok fiber from the pods of the ceiba or cotton tree serves as a filler in life preservers, mattresses, pillows, and other items for which buoyancy, lightness, and resistance to moisture absorption are important. Before the war, the Netherlands East Indies, particularly Java, were the principal producers, usually supplying more than 90 percent of the total. Ecuador was the second largest supplier.

The ceiba tree produces several valuable products, including a medicinal gum from the trunk, a rubberlike substance from the bark, edible oil from the seeds, and lumber. Its most valuable commercial product thus far, however, is the white, fleecy fiber of its fruit known as kapok. In Ecuador, kapok is collected from uncultivated trees along the coast from the island of Puná to Manta and in the western part of the Guayas River Basin. Loja Province is reported to have more trees than other zones, but because of poor transportation little kapok is gathered there.

Exports of kapok from Ecuador have varied from less than 20,000 pounds in 1932 to 1,356,000 pounds in 1938, valued from $975 to $127,600, respectively. The value of the 1944 exports rose to $156,000, reflecting an increase in unit price from 7 cents per cwt. (112 pounds) in 1941 to 21 cents, c. i. f. New York, in 1944. Part of the variation in export results from the uncertainty of the crop and part from the fluctuating demand. Even before the war, the United States was the principal market, absorbing from one-half to three-quarters of the total.

## Vegetable Tanning Materials

Production of tanning materials from local sources is almost sufficient for domestic leather-tanning and shoe-manufacturing industries. The principal source of material is obtained from mangrove bark found on trees growing wild in many of the coastal sections of Ecuador. The trees are most abundant around the Gulf of Guayaquil and in Manabí and Esmeraldas Provinces. Some of the tanneries in the interior highlands use a bark obtained in the paramos known as "casca." Many tanneries follow the practice of tanning leather by placing the hides between layers of the bark rather than using the extract from it. Only one extraction plant is in operation, with an approximate processing capacity of 77,000 to 88,000 pounds of extract a month. About 6,600,000 pounds of bark a year are consumed in the manufacture of the extract and another 7,900,000 pounds in the local tanneries.

The mangrove tree, which sometimes grows to a height of from 100 to 150 feet, is used for both bark and fuel. In fact, the collection of the bark in the Guayaquil area is said to be a byproduct of the manufacture of charcoal that is in turn used for fuel in Guayaquil. The bark is collected by small operators, who sell it to the tanneries.

Exports of mangrove bark, made primarily to Peru, reached 103,600 pounds in 1939 and 1942, and exports of tannin extract totaled 83,800 pounds in 1941. The United States was the principal market for the extract from 1938 through 1941.

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## Panama Hats

Panama hats made from the leaves of the *toquilla* plant (*Carludovica palmata*) have long been a staple export item of Ecuador. The total shipped out increased during the war from an average of 1,400,000 hats during 1936–40 to an estimated 4,400,000 in 1944, when these hats ranked second only to rice in export value. Small amounts of the toquilla straw are also exported, but they are insignificant in comparison with the number of hats. About 85 percent of the hats are made in Azuay Province, but the finest grades are woven in the villages of Montecristi and Jipijapa in Manabí Province. A small quantity of the fiber originates in the Oriente and in Santa Elena in Guayas Province.

Toquilla straw comes from a small fan-shaped "tree" without a trunk, which usually grows wild on the heavy fertile soils of the lowlands. The leaves grow to a length of from 5 to 7 feet and must be cut from the plant before they open. They are stripped of their outer filaments and the remaining fibers are dipped into boiling water, dried in the shade, and bleached in the sun before they are woven into hats. An average of approximately one-half pound of fiber is used for one hat. The making of the hats is a cottage industry, the quantity of fiber gathered and processed depending on the price for hats.

## Government Policy

The general forest policy of Ecuador is represented by the basic forest law of October 18, 1939 (published in the *Registro Oficial* of August 21, and 22, 1940). The objectives of this law are to protect the forests against excessive cutting, prevent erosion caused by the action of the snow and water on land not protected by trees, save water for agricultural use, and encourage exportation. The Ministry of Agriculture was charged with the responsibility of regulating and conserving the forest resources.

In view of the accelerated exploitation of the forests during the war, reforestation was encouraged by two decrees (No. 634 of August 1, 1944, and Supplementary Decree No. 68 of June 30, 1944), exempting certain wooded areas from the rural property tax.

In 1943 a forest mission from the United States surveyed certain of the forest regions of Ecuador and recommended a program[4] including: (1) Land classification; (2) establishment of forest reserves to assure a well-distributed timber supply; (3) protection and management of wooded areas by trained foresters; (4) forest research, possibly in cooperation with other Andean countries; (5) forestry education; (6) better transportation facilities; and (7) improvement of living conditions in the Occidente, where much of the valuable timber is located, to enable the people to develop the forest resources there.

## Effects of the War

Now that hostilities have ceased, exports of many forest products are expected to contract under peacetime conditions. The future volume of trade in these products will depend on a multitude of factors. Cinchona and rubber will soon have to compete not only with the Far East but with synthetic products already on the markets. Tagua nuts also are even now competing with the rapidly growing plastics industry. In the past, peacetime uses for balsa required only a fraction of the quantity supplied during the war. New uses may be developed for this product, however, which may increase its peacetime value. Panama hats, a staple export item for years, probably will continue to enter foreign trade in quantities at least equal to the prewar volume. The sharp increase in shipments during the past few years, however, when they have substituted for hats formerly supplied by southern Europe, probably cannot be sustained.

The adverse effects of the reduction in volume of exports of forest products will fall most heavily on processors, middlemen, and shippers who benefited most by increased production and export. The loss of exchange occasioned by curtailed exports will provide less for the purchase of imports and result in a retrenchment to prewar levels. The laborers drawn into the production of strategic crops are largely unskilled workers that probably cannot be absorbed into industrial employment in Guayaquil. Most of these moved into war work from subsistence agriculture to which they will no doubt return.

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[4] See footnote, 1, p. 76.

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